



Modified Tension Band Wiring Technique for the Treatment of Fracture Patella is Still a Gold Standard Option – A Study Evaluation

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Abstract

Background: Patella fractures account for approximately 1% of all skeletal injuries. The treatment of patellar fractures has undergone many changes in operative methods. But still the Modified Tension Band Wiring Technique is well practicing. This study is directed towards the clinical evaluation of Modified Tension Band Wiring Technique for treatment of fracture patella.

Methods: This study was design to evaluate the above title from January 2012 to December, 2016 in different Medical Center of Kishoreganj, Bangladesh. 38 patients were included in this study in where age of the patient was ranging from 18 to 50 years. Operative procedure was done according to AO principle of operation. In this study Modified Tension Band Wiring Technique in fracture patella was performed. Patients were follow up for 6 to 10 month and evaluate clinically, radiologically and functionally.

Result: Subjective complaints and objective deficiency were recorded accordingly with other necessary parameter for evaluation of study. The result was graded with the criteria of 26 patients healed within 4 months of operation with excellent result, 10 patients showed good result. 2 patients with infection that controlled with judicious use of antibiotic. 2 patients showed poor outcome which left for further procedure [1].

Conclusion: The current study suggested that treatment of fracture patella with Modified Tension Band Wiring Technique is still a gold standard for this orthopedic condition.

Keywords: Intertrochanteric fracture; Unstable; Intramedullary fixation

Abbreviations: MTBW: Modified Tension Band Wiring

Introduction

Patella fractures comprise 1% of all fractures encountered in the emergency department and only

a third of these require surgical intervention [2]. Among patellar fractures treated surgically, approximately 20% involve the inferior patellar pole [3]. Historically, a debate existed between resection of the inferior pole versus surgical reduction and fixation. Currently, clinical and biomechanical studies have provided definite

evidence that resection disrupts the extensor mechanism by decreasing the lever arm at the knee joint [4]. Operative fixation of displaced patella fractures has now become the standard of care of these injuries [5].

Several different techniques for internal fixation have been proposed and employed over the years with different rates of success [6]. Historically, the most commonly used technique for managing patellar fracture fixation is represented by the modified tension-band wiring technique [7,5]. This technique neutralizes tension forces anteriorly produced by the extensor mechanism at knee flexion and converts them into stabilizing compressive forces at the articular surface. This construct represents the most widely used method of fixation for transverse and comminuted patellar fracture [8].

Operative treatment is recommended for displaced patellar fractures to restore the continuity of the extensor mechanism of the knee and to anatomically reduce the patellar articular surface and among the multiple option the prepared method of fixation is modified tension-band construct [9-11] Commonly, parallel longitudinal Kirschner wires are inserted across the fracture and wire is looped around the Kirschner wires and over the anterior aspect of the patella in a figure-of-eight patterns [12]. Biomechanical studies demonstrate that both constructs resist fracture displacement.

Materials and Method

In this series 38 cases of fractured patella were treated in different medical centre of Kishoreganj, Bangladesh within January 2012 to December 2016. Age of the patient was ranging from 18 to 54 years. Two patients with diabetes mellitus and 6 patients with essential hypertension were managed with insulin and anti hypertensive drug accordingly. Inclusion criteria were all transverse fracture patella. Exclusion criteria were patient medically unfit for surgery, undisplaced fractures, and patients aged less than 18 years and over 50 years, stellate fractures. Initially all the cases were managed with long leg back slab with necessary medication and prepared for surgery. At the same time patient were taught static quadriceps drill and straight leg raising exercise. Operations were done at a later after subsiding acute swelling. All patients underwent open reduction and internal fixation with Modified Tension Band Wiring technique. Special attention was given to mobilize the knee early as it helps to regain the quadriceps power and normal knee function.

Operative procedure

Under spinal anesthesia operation was performed with the help of Tourniquet which was applied at the upper part of the thigh to ensure bloodless operative field. Anterior vertical incision was given. All the steps of operation were performed with AO principle. About 5 mm from anterior surface of the patella, one hole is drilled with a 2 mm drill bit. A 1.6 mm K-wire was inserted in the first hole and is used as a guide to drill the second hole parallel to the first. To ease drilling the proximal fragment is held with reduction clamps and the fragment tipped so that the fracture surface faces the surgeon.

Now the fracture is reduced and holds with towel clip. The accuracy of the reduction is checked by inspection and palpating the anterior and posterior surface in case of retinacular tear. The K-wire was removed and two holes are drilled into the distal fragment from the proximal fragment. The drill bit is removed and replaced with 1.6 mm K wires which are hooked at the tip. A 20 gauge wire was passed around the K-wire in a figure of 8 patterns so that the eye comes to lie next to the proximal end of the lateral K-wire. This facilitates future metal removal. The wire is then tightened with the AO tightener. After tightening the wire the tightener is tipped 90° and cut about 1 cm long and the cut end buried in the soft tissues.

The K-wires was adjusted so that the curved ends faced backwards, pulled down and hammered into bone. The distal portions are cut off about 1 cm from where they exit from bone. The joint capsule and quadriceps retinaculæ were meticulously repaired and the fascia repaired with vicryl sutures. The skin is closed with interrupted mattress sutures and a compression bandage was applied. No drain tubes were used.

Post-operative management: The patient is advised to do quadriceps exercises from the first post operative day onwards and was allowed full weight bearing from the 3rd day after removal of the compression bandage. Later knee flexion was started with the precise quadriceps exercises and taught the patient to do it at home. Stitch were removed two weeks after operation and the patient was discharge with advice for follow up.

Follow up: The patients on discharge were advised to report for follow up after 1 month in the first instance and then after every 2 months. During each follow up patients were questioned about subjective complaints like pain, difficulty in walking, squatting, climbing and stepping down stairs and inability to perform normal work.

Duration of follow up was 6th months to 10th months.

Observation

Pain: All the cases had pain during the first 2 weeks. 26 cases had not experienced of pain after 2 months. 10 cases considered to be good with mild pain at the end of the 2nd month. 2 cases complained of persistence of pain even after the end of 2nd months.

Swelling: During the first month mild swelling was present in almost all cases. At the end of 2nd month only 2 cases experienced of mild swelling.

Difficulty in squatting: In this series 10 of the patients had mild difficulty in squatting. But getting up from the squatting position was not difficult and 2 patients were unable to squat (Table 1).

Complaints	Number of cases	Percentage
Pain	12	31.6
Mild Difficulty in Squatting	10	26.3
Unable to squat	2	5.26
Difficulty in climbing stairs	2	5.26
Difficulty in stepping down stairs	-	-

Table 1: Subjective complaints following modified tension band wiring.

Movements: 10 cases had limitation of flexion of only terminal 20° and 2 case had flexion <120° and so 12 cases had limitation of knee flexion. All the other 26 cases regain almost full range of knee movement.

Wasting of thigh: 10 cases had wasting up to 1cm and 2 cases up to 2cm wasting. Early and effective

physiotherapy is essential in obtaining an excellent result.

Power of the quadriceps: Quadriceps strength was graded 0-5 from no muscle activity to full strength. It was assessed by comparing with the normal side. In this series 12 cases had grade-4 strength. All the other cases had grade-5. Patient cooperation and physiotherapy are very important for the recovery of muscle power and function of knee joint.

Extension Lag: None of the patient had extension lag (Table 2).

Deficiency	Number of cases	Percentage
Limitation of flexion	12	31.6
Quadriceps wasting of up to 1 cm	10	26.3
Quadriceps wasting of up to 2 cm	2	5.3
Quadriceps power of grade-4	12	31.6
Extension lag	None	None

Table 2: Objective deficiency after modified tension band wiring.

Result

In this series 38 patient were included in where 24 cases were fracture patella of right side and 14 patients were in left. Out of 38 patient 30 were male and female were 8 in number. Mechanism of injury was predominantly indirect quadriceps tendon injury in case of 24 patients, direct trauma in 8 and road traffic accident in 6 cases (Figure 1).

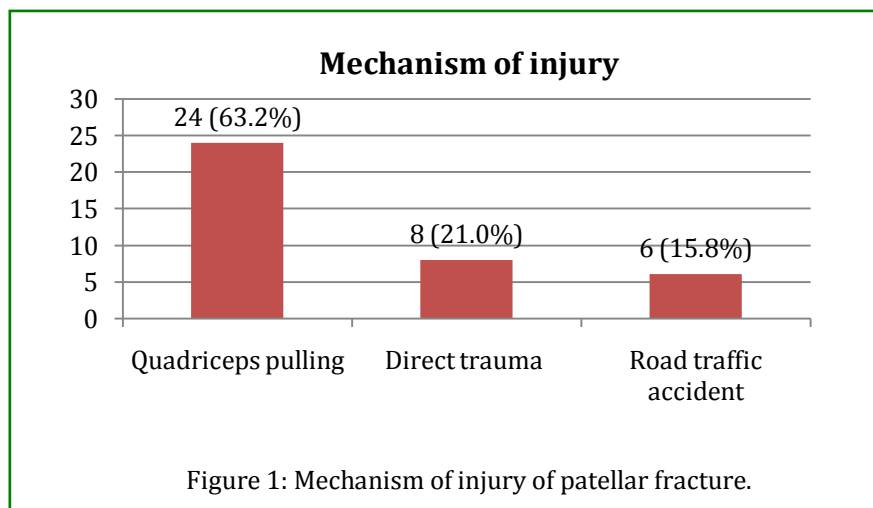


Figure 1: Mechanism of injury of patellar fracture.

Final outcome was graded as excellent, good and poor according to criteria of Mugadlimath et al. [1]. Criteria to grade the outcome according to Mugadlimath et al. [1].

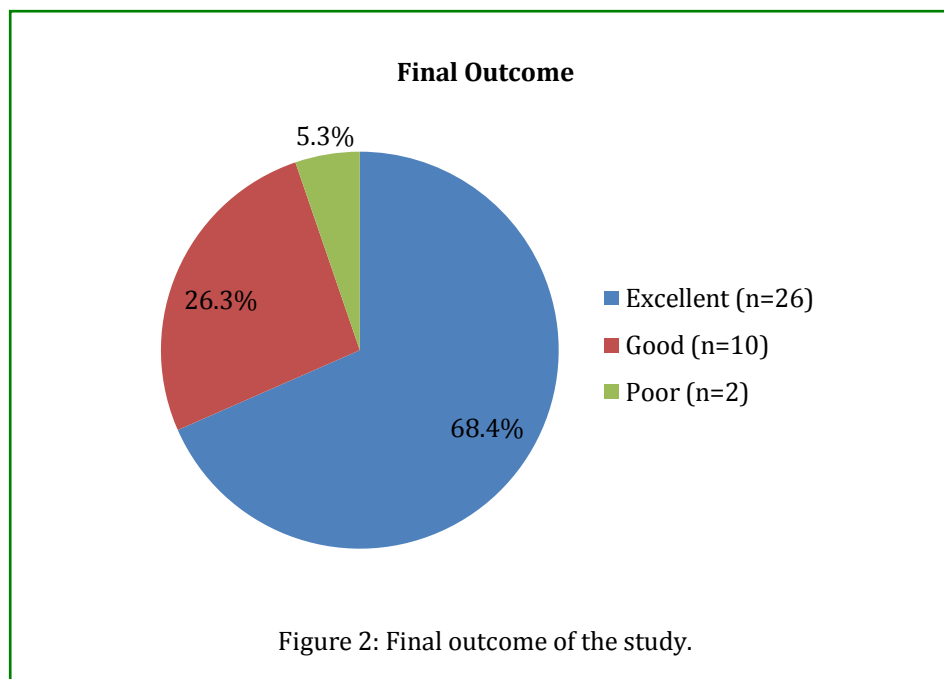
Excellent: The knee was functionally normal. The patient has no subjective complaints like pain, difficulty in squatting and climbing steps and objective deficiencies like quadriceps wasting and limitation of flexion with extension and normal quadriceps power.

Good: There was occasional pain. Patient can squat and climb steps with some difficulty. Limitation of

flexion less than 20°, quadriceps wasting less than 1cm, and reduction of quadriceps power from grade-5 to grade-4.

Poor: Cases which failed to attain the above standards.

According to criteria of Mugadlimath et al. [1] final outcome of the study shows that 26 cases (68.4%) achieved excellent result and 10 cases (26.3%) showed good result. 2 cases (5.3%) gained poor outcome. Sum of excellent and good result is 94.7% and unsatisfactory with poor outcome is 5.3% (Figure 2).



Discussion

The patella facilitates knee extension by increasing the distance of the extensor mechanism from the axis of knee joint motion. The objectives of operative treatment are anatomic reduction of the articular surface and restoration of the extensor mechanism while preserving the patella. Internal fixation is used to maintain reduction until fracture heals [13]. Early motion also shown to be beneficial for articular cartilage nutrition. Addition of an anterior tension band may help to resist some of the tensile forces across the fracture site with the knee in a flexed position, and actually convert them to compressive forces at the articular cartilage as the knee flexes [8]. This principle also exists in our series. Loosening of the implant is considered as an important complication of patellar fracture fixation. The surface of k-wire is smooth, so loosening of k-wire may occur with time [14]. But in the present

series no remarkable loosening was found during follow up.

In the present study 26 (68.4%) had excellent result, 10 (26.3%) had good and 2 cases (5.3%) achieved poor results. Dudani & Sancheti [15] in their study also found similar results 11 (73.33%) excellent and 4 (26.66%) good result. But in their study no poor outcome but in our study 2 patients with poor outcome recorded. Levack et al. [10] found 7 (50%) excellent result, 5 (35.71%) good result and 2 (14.28%) had poor outcome. This series showed much better outcome than that of the series of Levack et al. [10]. In the study of Mugadlimath et al. [1] excellent is 70%, good 5% and poor is 5%. Result of current study is almost similar to the study of Mugadlimath et al. [1].

The patients who achieved good outcome can also performed normal daily activities carefully and the result is rational and acceptable. Summation of

excellent and good result is 36 (94.7%). In comparison to above mentioned series this study is similar or in some cases outcome is better (Table 3).

Study	No of cases	Excellent	Good	Poor
Dudani, Sancheti	15	11 (73.3)	4 (26.6%)	0
Levack, Flannagan, Hobbs	14	7 (50%)	5 (35.7%)	2 (14.2%)
Mugadlimath et.al	20	14 (70%)	5 (25%)	1 (5%)
Present study	38	26 (68.4)	10 (26.3%)	2 (5.3%)

Table 3: Comparison of results of present study with other studies.

Conclusion

Fracture patella treated with modified tension band wiring technique is bio-mechanically well established for long time. Though there are also other options of this orthopedic condition but this study suggested that still this option is gold standard. Result of the technique also depends on skill surgery, patient's compliance, meticulous and precise quadriceps exercise and also control of infection. If this can be performed result will be excellent in all respect. Large sample size and long time follow up may delineate further more conclusive opinion.

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